thirty species of Amazon parrots known; which, then, is "the Amazon parrot" figured? The text is appealed to for an answer in vain. Not two lines are devoted to the Macaws. The same is very much the case all through: thus, the honey-guide is figured after Keuleman's sketch; eleven species are known, but neither is the name given of the species figured, nor is the name given of the species whose habits are described. The common goat-sucker, the whip-poor-will, and the lyre-tailed nightjar, are figured, and yet no scientific names for them are to be found. No doubt both author and editor will agree with us that the value of this work would be greatly added to if the good example set in this matter by Mr. Dallas were followed. The illustrations are in general very good, but is there not one egg too many in the nest of the edible-nest swiftlet? The general get-up of the volume—type, paper, and binding—are all that could be wished, and despite the few things in it which we think might be amended, we most cordially recommend it and its predecessors as very excellent volumes on the natural history of the mammals and birds.

PROF. HUXLEY ON TECHNICAL EDUCATION

AT the lecture by Prof. Silvanus Thompson, on "Apprenticeships," at the Society of Arts last week, Prof. Huxley was in the Chair, and in inviting discussion on the paper, said he would commence it by making a few remarks himself. He had listened to Prof. Thompson's paper with gratification, not only on account of the good sense it embodied, but also for a more selfish reason, inasmuch as it entirely accorded with the views which he, coming to the matter from a different side, had himself expressed. Unfortunately he had no personal acquaintance with the ordinary kinds of work in what were called handicrafts, but he ventured some two years ago in that very room to point his remarks with respect to technical education by the knowledge he possessed of medical education. He then expressed a hope that something real and practical would soon be done by the City Guilds, which had done him the honour of consulting him on this subject of technical education, and the advice he gave them was in precise accordance with the principles which Prof. Thompson had laid down that night. Whatever might be the merits or demerits of the old system of apprenticeship, it was as thoroughly doomed in the different kinds of ordinary handicrafts as it had been long doomed in physic. The only alternatives appeared to him to be of two kinds. In the first place, we ought to bring within the reach of the young people who were employed in our great manufactures the means of carrying on their education in the particular branches of business with which they were respectively occupied beyond the time during which the necessities of practical life obliged them to be at work in the workshop—that is to say, for a period corresponding virtually with what used to be their apprenticeship. One of his suggestions, therefore, was that there should be established in the neighbourhood of the great centres of industry schools to which young boys who are learning certain handicrafts could resort in order to receive instruction which would qualify them to work skilfully and intelligently at their trade. He likewise suggested that the guilds should employ part of their large funds in the establishment of a central institution, which should do for the teaching-power of the country that which such institutions as the École des Arts et Métiers in France, and the Polytechnicum at Zurich, did in their respective countries. In England there was not only a total absence of schools to which apprentices could resort, but there were no teachers competent to teach in such schools, even if they were established. He thought that the suggestions he made to the guilds were of a sound and practical nature, and calculated to advance the interests of technical education in this country. He understood Prof. Thompson to object to the existing elementary training in our Board schools on the ground of its technical nature and of its occupying the minds of the student entirely with book learning and matters which had no sort of bearing on his future life. No one endeavoured more earnestly than he, when he occupied a seat at the School Board, to remedy the evil of the exclusively book character of our ordinary school instruction. He did not entertain the slightest doubt that an extension of the Kindergarten system, including the use of tools and the knowledge of elementary machines, was a matter of great importance, but he could not think that the evil of not giving hand-work in the elementary schools was after all very great. Although it was a great thing to make skilled workmen, yet it was much more important to make intelligent men. The four or five years during which children ordinarily remained at school were not too much to devote to even an exclusive study of reading, writing, and arithmetic, and to the acquirement of some intelligent knowledge of geography, the elements of history, and the rudiments of physical science. On this point he might observe that no pupil was admitted to the Ecoles d'Apprentis in Paris until he was thirteen years old, or unless he presented his certificate of elementary education. If we attained one half or a quarter of the good results reached in the Écoles d'Apprentis, the improvement in the condition of the average British workman would be exceedingly great.

In proposing a vote of thanks to Prof. Thompson for his paper, Prof. Huxley expressed his belief that, as far as London was concerned, it would be a scandal and a robbery if a single shilling were asked for out of the general revenues of the country for technical education. The City of London Guilds possessed enormous wealth, which had been left to them for the benefit of the trades they represent. If the people did not insist on the wealth being applied to its proper purpose, they deserved to be taxed down to their shoes. It would be well if those who had charge of these matters in the city of London would understand that they were morally bound to do this work for the country, and he hoped if they continued to neglect the obligation they would be legally compelled to do it.

NOTES

NO more than justice has been done to Sir Joseph Whitworth by granting him a prolongation for five years for his process of manufacturing fluid-compressed steel. The powerful evidence brought before the Committee of the Privy Council as to the utility of this steel could not be resisted. Mr. James Wright, the Engineer-in-Chief of the Navy, stated that the invention "has met a want long felt for the principal parts of marine engines which have been subject to failures;" from his experience of it he has perfect trust in it. Mr. Hotchkiss, the patentee of the revolving cannon used by the French Government, stated that he never had occasion to reject a single *barrel* of the steel. The evidence from Mr. J. Davidson, of Woolwich, Mr. Purdey, the well-known gun-maker, and others, showed that by getting rid of the air-cells the steel answered perfectly, and is a better metal than had ever been produced by any previous process. Their Lordships were satisfied that it would in all probability be highly useful "in carrying out the highest achievements of engineering skill."

THE long-expected experiments by the *Thunderer* Gun Committee commenced on Tuesday at the proof butts on the Government marshes, Woolwich. In connection with these experiments, Sir William Palliser organised, and last week carried out, a successful series of experiments with a doubly-loaded gun, in order to ascertain whether double-loading was or was not the cause of the bursting of the *Thunderer's* gun. Five double charges were fired, each successive charge being increased in length. No sign of flaw or damage could be perceived. A similar result attended experiments with an air space between the powder charge and the base of the projectile. But when shall we have a gunner like Froude to abolish experiments on the scale of 12 inches to a foot? The navy now build a paraffin boat for a few shillings, instead of a real one costing a quarter of a million to experiment with. What will the experiments, including the bursting of the gun, cost? If smaller experiments cannot be devised, no one has a right to say that Palliser's experiments on a smaller scale teach us nothing.

We are glad to see that decisive action has been taken on the side of the United States for the acquisition of the ground in the neighbourhood of Niagara Falls as an International Park, and so preserve visitors from the innumerable annoyances to which they are at present subject. At a meeting of the Board of Commissioners of the New York State Survey, on November 20, Director Gardner, of the Survey, presented conclusions arrived at by the board at its meeting in Niagara last September, illustrated with maps, diagrams, &c. The plan proposed is to take a strip along the American bank, varying from 100 to 600 feet in width, extending two miles from the new suspension bridge to the head of the rapids, and plant it with trees, to shut out from view the ugly bazaars, manufactories, booths, and hotels which destroy the natural scenery of the banks. The plan also involves the purchase of Goat and Bath Islands, which, the Commission has reason to believe, can be bought. The proposed park will extend to and include Canal Street, in the village, over which the State now has jurisdiction. Director Gardner places the total amount required to secure all the property needed at 800,000 dols. The Commissioners thought the estimate too low. A report recommending that the State shall purchase the property will be prepared by Messrs. Dorsheimer, Stout, and Barnard. It is the unanimous opinion of the Commission that New York should proceed to reclaim her side of Niagara without reference to what Canada may do. One map, shown by Director Gardner, indicated that the recession of the Falls since 1842, when a trigonometrical survey was made, has been something over 100 feet.

French meteorologists have observed a curious analogy between the present season and the severe winter 1788-1789. This winter was observed and described by Cotte, one of the most celebrated French meteorologists. The frosty weather set in on November 25, and ended on January 13. On December 25 intervened a partial thaw. The end of January and February were relatively genial, and the frosty weather again set in on March 4, and kept on up to the end of the month. Frost was so intense that wine was congealed in cellars. The thickness of ice on the Seine was 18 inches, and the breaking of the ice happened only on January 20. Note was carefully taken of the minima observed in a large number of Continental cities. It was observed that the minimum of temperature happened in Germany on December 18, in France on the 31st, and in Russia only on January 5. During frosty weather the wind was almost always blowing from north-east with clear sky. Sometimes it was blowing from south, but then snow was falling, sometimes with great abundance.

The quantity of snow which fell in Paris during the day of December 4 and the ensuing night, according to a calculation made by a member of the Municipal Council, amounts to 245,000,000 cubic feet for the interior of the fortifications. It has been estimated that the expense for removing by handwork and carting this immense quantity of snow, would be about 800,000 francs.

The dates of the freezing of the Neva have been carefully observed from 1703. It has never frozen sooner than in 1805, on October 16, nor later than in 1740, when it froze on December 28. This year the date is November 15; the mean date is November 13.

Some curious statistics of gas-lighting in Paris have been published recently. The greatest duration of public lighting is 14h. 30m., and smallest 5h. 25m. The cost of gas for public and private establishments is 2,000,000*l.*, about *one pound* per head for each inhabitant of Paris. The total consumption of gas is 6,500,000,000 cubic feet. In 1880 the Paris Municipality intends to enlarge its lighting expenses by 16,000*l.*, and 8,000*l.* for establishing new gas-lamps. No provision appears to be made for electricity.

The excavations at Olympia under the auspices of the German Government have been resumed this winter with a force of 100 workmen. A statue of Nemesis, and heads of Titus, of a kneeling infant, and of Paionios' Nike have already been unearthed this season. The total number of works of art thus far excavated is sixty-seven, consisting of forty-one figures and twenty-six heads.

We regret to have to record the death of Madame Louis Figuier, the wife of the well-known author of so many popular works in science. Madame Figuier has written a number of plays, and has been a fellow-worker with her husband in the publication of his "Théâtre Scientifique," which has appeared quite recently anonymously.

Dr. H. Trimen, who leaves England to assume his appointment in Ceylon in January, is succeeded in the editorship of the *Journal of Botany* by Mr. James Britten, F.L.S., of the Botanical Department of the British Museum.

A Meteorological station has been opened at Prato, thus connecting Fiesole and Florence with Pescia and Lucca.

Telegraphic communication between Paris and other cities of France and the Continent has been almost interrupted by snow. It is only in Germany that the telegraphic service has continued almost unimpeded, owing to the establishment of subterranean communications.

Messrs. Sampson Low and Co. are about to publish Dr. August Weismann's "Studies in the Theory of Descent," with a prefatory notice by Charles Darwin, F.R.S., translated and edited, with notes, by Raphael Meldola. Part I.—On the Seasonal Dimorphism of Butterflies (with two coloured plates). Part II.—On the Origin of the Markings of Caterpillars; On Phyletic Parallelism in Metamorphic Species (with six coloured plates). Part III.—On the Transformation of the Mexican Axolotl into Amblystoma; On the Mechanical Conception of Nature. The German text, we are informed, has been carefully revised and brought down to date by the author, under whose supervision the chromo lithographic plates have been accurately re-drawn and engraved.

We understand that Mr. Anderson's long-promised work on Lightning Conductors will now be issued in a few days. Messrs. Spon, of Charing Cross, are the publishers.

The well-known Boulak Museum at Cairo has been undergoing repairs, and the fine collection was deposited in a neighbouring warehouse under what seemed proper guardianship. But, the *Times* correspondent writes, robbers the other day broke in through the roof, and they must have been robbers of a certain rank of intellect, for some 80 or 100 scarabees of great value pecuniarily, and impossible to replace, as they related to the early dynasties, were abstracted, although they were things of no apparent worth to an ignorant person.

A correspondent of the *North China Herald* understands that the director of the magnetic and meteorological observatory connected with the Roman Catholic mission establishment at Sikawei, near Shanghai, has good reason to suppose, after a careful study of the typhoon of July 31, that the Chinese typhoons, like the cyclones of the Bay of Bengal, do not have their centre eight points to the right from the direction of the wind (the face being turned against the latter), as is generally supposed, but from nine to ten points. It is certainly of the utmost importance to navigators that this conclusion of Père Dechevrens should be carefully investigated, to which end the cooperation of ship-masters is invited. They should forward observations of the barometer and thermometer, force and direction of the wind, mentioning the latitude, longitude, and height above the sea-level of the spot where their observations have been taken, the description of instruments used, whether the thermometer is attached to the barometer, and what corrections, if any, are to be applied, with general description of weather, &c.

WE have received the seventh edition (November, 1879) of Prof. E. Morren's "Correspondance Botanique." There is no alteration this year in the plan or scope of this useful botanical directory for the whole world; but the necessary corrections and additions seem very carefully made up to the date of issue. The only noteworthy additions to the list of names for each country are in the case of France, which requires two extra pages, and Italy, which takes one page more than last year.

THE Associated *Soirée* of the Literary, Scientific, and Art Societies of Liverpool was held in St. George's Hall yesterday. The programme was of a varied character, both literature, science, and art, being well represented upon it. The idea of thus uniting the various classes of societies in a large town is a happy one, and deserves imitation.

WE notice from the November number of the *University College of Wales Magazine* that numerous important additions have been made to the museum of that institution, which now contains collections of very varied character.

Science Gossip for December publishes a useful list of naturalists who are willing gratuitously to assist learners of natural history and others, personally when practicable, otherwise through the post.

PROF. NEWBERRY has reprinted his article on the "Geological Survey of the Fortieth Parallel" (New York, Appleton) from the *Popular Science Monthly.* We have at various times referred to the volumes of this magnificent work; Prof. Newberry's paper gives a good *résumé* of the whole.

THE *Colonies and India* calls attention to the fact that a small quantity of flax grown in West Australia, which recently fell into the hands of an English manufacturing firm, was found to be of such excellent quality that a large demand has suddenly sprung up in the colony for both indigenous and cultivated flax.

THE additions to the Zoological Society's Gardens during the past week include three Pin-tailed Whydah Birds (*Vidua principalis*) from Africa, presented by Capt. T. H. Bowyer Bower; two Common Chameleons (*Chamæleon vulgaris*) from North Africa, presented by Capt. Burke; a Mississippi Alligator (*Alligator mississippiensis*) from the Mississippi River, presented by Mr. W. G. Marshall; a Slow-worm (*Anguis fragilis*), European, presented by Mr. W. A. H. Bernard Smith; two Red River Hogs (*Potamochœrus penicillata*) from West Africa, two Elliot's Guinea Fowls (*Numida ellioti*) from East Africa, an Elephantine Tortoise (*Testudo elephantina*) from the Aldabra Island, deposited; two Prong-horn Antelopes (*Antilocapra americana*) from North America, a Slow Loris (*Nycticebus tardigradus*) from Malacca, a Laughing Falcon (*Herpetotheres cachinnans*) from Brazil, a Bar-tailed Godwit (*Limosa lapponica*), a Common Curlew (*Numenius arquatus*), two Pomatorhine Skuas (*Stercorarius pomatorhinus*), European, purchased.

OUR ASTRONOMICAL COLUMN

ORBITS OF BINARY STARS.—In addition to elements of O. Σ. 235, which apppear in the recently-published "Handbook of Double Stars," Dr. Doberck has lately investigated orbits for the binaries 4 Aquarii and μ^2 Herculis, stars for which no similar computation had been previously made. He assigns a period of 129·8 years for the former, the passage of the periastre at 1881·80, and for the latter a period of 54·25 years, the periastre at 1877·13. The elements give the following angles and distances:—

4 Aquarii.					μ^2 Herculis.				
		°		″			°		″
1880·5	Pos.	188·2	Dist.	0·32	1879·5	Pos.	241·1	Dist.	1·05
1885·5	,,	242·0	,,	0·22	1880·5	,,	247·1	,,	1·04
1890·5	,,	295·9	,,	0·32	1881·5	,,	253·4	,,	1·01
					1882·5	,,	260·1	,,	0·97

The extent of Dr. Doberck's investigations relative to the orbits of the revolving double-stars will be seen from the following nearly complete list of objects, for which we are indebted to him for the best systems of elements yet in our possession:—Σ 3121, μ^2 Hercules, O.Σ. 298, α Centauri, γ Coronæ Borealis, ξ Scorpii, Σ 3062, ω Leonis, *p* Eridani, Σ 1768, ξ Bootis, 4 Aquarii, τ Ophiuchi, η Cassiopeæ, λ Ophiuchi, 44 Bootis, μ^2 Bootis, 36 Andromedæ, γ Leonis, σ Coronæ Borealis, α Geminorum, ζ Aquarii, O.Σ. 235. It must be borne in mind, in order to appreciate the amount of labour involved in these researches, that in the majority of cases the orbits are not the results of rough or graphical approximations, but have been worked out with a degree of refinement, which exhausts the data actually at Dr. Doberck's command. He has made this subject as much his own as Prof. Julius Schmidt has in his case that of the variable stars.

ERRORS OF THE LUNAR TABLES.—Prof. Winnecke publishes observations of the moon made by Dr. Schur at the provisional observatory of the University of Strassburg in the year 1878, and the corrections required by Hansen's tables, and by the same tables as improved by Prof. Newcomb, who showed the large and increasing deviation of the tables would almost wholly disappear if, for the empirical term, an empirical alteration of the other term due to the action of Venus is substituted, and suitable alterations made in the elements of mean motion. The advantage derived by the introduction of Newcomb's corrections is seen to be very considerable, the signs alternating in the course of the year, and the corrections being generally small, while with Hansen unaltered there is a larger and uniformly negative correction throughout.

From the same observations there is deduced a correction to the mean semi-diameter adopted in Hansen's tables amounting to – 1″·29. Soon after the appearance of these tables, Dr. Oudemanns, by a careful discussion of occultations and direct heliometric measures, inferred a correction of – 1″·09. If the mean of these values be adopted, we shall have for the moon's mean semi-diameter, 15′ 32″·16. Dr. Oudemanns' paper will be found in vol. xxvi. of the *Monthly Notices* of the Royal Astronomical Society.

RE-DISCUSSION OF ANCIENT SOLAR ECLIPSES.—The publication of recent investigations on the motion of the moon, appearing to render a new discussion of the ancient eclipses of the sun desirable, the work has been commenced under the auspices of the Smithsonian Institution, by Mr. D. P. Todd, of the American *Nautical Almanac* Office. The computations so far relate to the eclipses of Thales, Larissa, Ennius, Agathocles, and Stiklastad, and to the two eclipses of the thirteenth century, which have formed the subject of an important memoir by Celoria, of the observatory at Milan. It is proposed to extend the original scope of the research to include a large number of ecliptic dates, and great facilities are expected from the use of Newcomb's Tables of Eclipses, which have recently appeared. We shall allude further to these tables in a future column. It will be seen that this interesting research is in excellent hands.

THE SOLAR PARALLAX.—Mr. Downing, of the Royal Observatory, Greenwich, has made a determination of the sun's mean parallax from observations of Mars in declination at the observatories of Leyden and Melbourne, during the very favourable opposition in 1877, the same comparison-stars having been used at both stations. The observations were made between July and October, but Mr. Downing has only compared them on those days when planet and stars were observed at Leyden and